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| Examiner Name | Laforgia |
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| | |
|---|---|
| Applicant(s): Luciani | |
| Application No.: 09/434338 | Group Art Unit: 2131 |
| Filed: 11/4/1999 | Examiner: Laforgia |
| Title: System, Device, and Method for Supporting Virtual Private Networks in A Label Switched Communications Network | |
| Attorney Docket No.: 120/056<br>Nortel Ref: BA0352 | |

Commissioner for Patents
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RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Dear Sir:

In response to the Notification of Non-Complaint Appeal Brief, Applicants submit herewith the Appeal Brief in proper format.

Should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay McGuinness, Applicants' Attorney at so that such issues may be resolved as expeditiously as possible.

Respectfully Submitted,

5/11/05
Date

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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

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**APPEAL BRIEF OF James V. Luciani**
**FOR**
**System, Device & Method for Supporting Virtual Private Networks in a Label Switched Communication Network**

**Serial No. 09/434,338**
**Filed: December 11/04/1999**

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**Appeal from a decision of the Primary Examiner dated October 30, 2003**
**Technology Center 2131**
**Examiner Christian Laforgia**

*TABLE OF CONTENTS*

TABLE OF AUTHORITIES

## Cases

## I. Real Party in Interest

The real party in interest is Nortel Networks, Limited.

## II. Related Appeals and Interferences

Appellants are not aware of any appeals or interferences that are related to the present case.

## III. Status of the Claims

This is an appeal brief from a decision by the Primary Examiner dated October 30, 2003, finally rejecting claims 1-60, currently pending in the present application. No claims have been allowed. A notice of Appeal was filed on February 27, 2004. The rejection of claims 1-60 is hereby appealed.

## IV. Status of Amendments

In the Final Office Action dated October 30, 2003, claims 1-60 were rejected under 35 U.S.C. §103. No amendment pursuant to 1.116(a) was filed prior to the filing of the Notice of Appeal on February 27, 2004.

## V. Summary of the Invention

### A. Background

In today's information age, communication devices, such as computers and computer peripherals, are often inter-networked over a communication network. For various reasons, it is sometimes necessary or desirable for the communication network to be shared by multiple consumers. Because each of the consumers typically needs to maintain a certain amount of autonomy, the communication network is divided into a number of Virtual Private Networks (VPNs), where each VPN emulates a single, private network.

### B. Appellants' Invention

In accordance with one aspect of the invention, a Label Switched Path (LSP) is established for a VPN by including label information and a VPN identifier in Next Hop Resolution Protocol (NHRP) messages and using the NHRP messages to establish the LSP for the VPN. In particular, as described in Appellants specification, label switching is often used to eliminate the network layer processing by certain devices in the network. In order to use label switching for internetworking, each label switching device must learn the labels that are used by its neighboring label switching devices. Therefore, the IETF Multi-Protocol-Label-Switching (MPLS) working group has defined a Label Distribution Protocol (LDP) for distributing labels between neighboring label switching devices. [1] Each label switching device maintains a label information base (LIB) for mapping Forwarding Equivalency Classes (FEC) to a corresponding labels, where each FEC is a set of network addresses. When a label switching device receives a packet including a label, the label switching device utilizes the LIB to map the received label to a next hop FEC and to retrieve a label for the next hop FEC. The label switching device then replaces the label in the packet with the label for the next hop FEC, and forwards the resulting packet to the corresponding output path (or set of paths).

In an exemplary embodiment of the present invention, label switching is used to support VPNs in an MPLS environment by establishing a LSP for each VPN. Each station (host or router) maps each LSP to its respective VPN. Protocol messages that are associated with a particular VPN are carried over the corresponding LSP, specifically by inserting the appropriate label into the protocol messages and forwarding the protocol messages over the LSP.[2]

In a preferred embodiment of the present invention, label information is conveyed in Next Hop Resolution Protocol (NHRP) messages (often referred to as

[1] Appellants specification, page 6 lines 1-2 and lines 26-29
[2] Appellants' specification, page 7 lines 5-10 and lines 23-28.

"piggybacking") along with the VPN identifier so that each device along the forward path can correlate the LSP with the particular VPN. NHRP is a protocol described in IETF Request for Comments document (RFC 2332) entitled NBMA Next Hop Resolution Protocol. NHRP enables a source station (host or router) to determine the internetworking layer address and subnetwork address of a next hop station. Specifically, a label request is conveyed along with a VPN identifier in a NHRP Resolution Request message that is forwarded hop-by-hop along the forward path from the ingress device to the egress device. Label mapping information is conveyed along with a VPN identifier in NHRP reply messages that are forwarded hop-by-hop from the egress device to each device in the forward path and ultimately to the ingress device. [3] With such an arrangement, label distribution can be attained during the NHRP process.

Thus, in accordance with this description, independent claim 1 is directed to a method for supporting virtual private networks in a label switched communication system having an ingress device in communication with an egress device via a number of intermediate devices. (See for example Figure 8). The method includes label information (430) and a virtual private network identifier (420) in Next Hop Resolution Protocol messages (400), the virtual private network identifier identifying a virtual private network (See for example Figure 4), enabling use of the Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network (as shown in Figures 9A-9C and Figures 10A-10C). Independent claim 19 is directed to a device supporting virtual private networks using Next Hop Resolution Protocol, wherein label switching logic includes both a label request and a virtual private network identifier in a NHRP request message. Independent claim 36 is directed to a computer program

[3] Appellants specification, page 10 lines 2-9.

product having label switching logic programmed to include both a label request and a virtual private network identifier in a NHRP request message. Independent claim 53 is directed to a communication system wherein a label switched path is established for a virtual private network by including label information and a virtual private network identifier in a NHRP messages, and independent claim 56 is directed to a protocol message including a virtual private network identifier (420) and label information (430), as illustrated in Figure 4.

## VI. Issues

A. Whether claims 1-60 were properly rejected under 35 U.S.C. §112, first paragraph.

B. Whether claims 1-60 were properly rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 through 26 of Casey, U.S. Patent 6,205,488 in view of claims 1-50 of Luciani, U.S. Patent 6,614,791.

C. Whether claims 1, 14 and 53-55 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Liu, (U.S. Patent Number 6,079,020) in view of Armitage (U.S. Patent 6,374,303).

D. Whether claims 15 through 18 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Liu in view of Armitage and further in view of Halpern, U.S. Patent 6,438,100.

E. Whether claims 19, 20, 36 and 37 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Halpern in view of Liu.

F. Whether claims 21-35 and 38-52 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Halpern in view of Liu and further in view of Armitage.

## VII. Grounds of rejection to be reviewed on appeal

A. Claims 1-60 stand rejected under 35 U.S.C. §112, first paragraph, because the claim allegedly covers every conceivable means of achieving the stated purpose.

B. Claims 1-60 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-26 of U.S. Patent No.

6,205,488, hereinafter Casey, in view of claims 1 through 50 of U.S. Patent 6,147,791, hereinafter Luciani.

C. Claims 1-14 and 53-55 stand rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent 6,079,020 to Liu (hereinafter Liu) in view of United States Patent 6,374,303 to Armitage et al. (hereinafter Armitage). Claims 56-60 are rejected under 35 U.S.C. §103 as being unpatentable over Armitage in view of Liu.

D. Claims 15-18 were rejected under 35 U.S.C. §103(a) as unpatentable over Liu in view of Armitage as applied to claim 1 above, and further in view of United States Patent No. 6,438,100 to Halpern et al. (hereinafter Halpern).

E. Claims 19, 20, 36 and 37 were rejected under 35 U.S.C. §103(a) as being unpatentable over Halpern in view of Liu.

F. Claims 21 through 35 and 38 through 52 were rejected under 35 U.S.C. §103(a) as being unpatentable over Halpern in view of Liu as applied to claim 20 above, and further in view of Armitage.

## VIII. Argument

### A. The Examiner's rejection of claims 1-60 under 35 U.S.C. §112 first paragraph is improper.

Although it is true that a single means claim, i.e., where a means recitation does not appear in combination with another recited element of means, is subject to an undue breadth rejection under **35 U.S.C. 112**, first paragraph. *In re Hyatt*, 708 F.2d 712, 714-715, 218 USPQ 195, 197 (Fed. Cir. 1983), Appellants' claims 1-60 are not single means claims. Appellants independent claim 1 is a method claim with multiple steps, independent claim 19 is a device claim including label switching logic, independent claim 36 is a program product including a

computer program comprising label switching logic, and independent claim 53 is a communication system comprising an ingress device in communication with an egress device. For at least the reason that Appellants' claims are not single means claims, this rejection is improper and should be withdrawn.

In addition, contrary to the Examiners assertion that the claim language covers every conceivable means of achieving the stated purpose, Appellants submit that their claim language is quite specifically drawn to a method or device in which label information is forwarded in protocol messages of a specific type; i.e., the Next Hop Resolution Protocol messages. Such language clearly defines the scope of the invented subject matter. As such, for the reason as well that the claims are specific, Appellants submit that the rejection is improper and should be withdrawn.

**B. The Examiner's rejection of claims 1-60 under the judicially created doctrine of obviousness double patenting is improper because the claims of the present invention are patentably distinct from the claims of Casey and Luciani.**

The Examiner stated in the Final office Action for this application, dated October 30, 2003, that:

> "... Claims 1-60 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 through 26 of Un.S. Patent no. 6,205,488, hereinafter Casey, in view of claims 1 through 50 of U.S. Patent No. 6,614,791, hereinafter Luciani. The combination of Luciani with Casey is proper as will be shown below. Casey discusses the need for communication between various customer sites that are geographically dispersed. There are several problems in providing this service, such as address conflicts, security problems, scalability issues and performance problems. Luciani provides a method of addressing the address conflicts, scalability issues, and performance problems by providing for a VPN identifier transmitted in each packet. With providing for this packet, it alleviates the issues of address conflicts, scalability and performance issues..."

Appellants fail to see how such reasoning justifies a double patenting rejection of the present claims. The Manual of Patent Examination Procedure, §1504.06 describes the appropriateness of the double patenting rejection.

A rejection based on nonstatutory double patenting is based on a judicially created doctrine grounded in public policy so as to prevent the unjustified or improper timewise extension of the right to exclude granted by a patent. In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993). A nonstatutory double patenting rejection of the obviousness-type applies to claims directed to the same inventive concept with different appearances which are obvious variations of each other, that is the claimed designs are different in appearance but are not patentably distinct.

The obviousness-type double patenting rejection must be based on the obviousness standard of **35 U.S.C. 103(a)**. That is, differences between the claimed designs must either be de minimis and unrelated to their overall aesthetic appearance or must be obvious to a designer of ordinary skill in the art related to the claimed design. If the claims are considered obvious under **35 U.S.C. 103(a)**, an obviousness-type double patenting rejection must be made. ... In determining whether to make this type of nonstatutory double patenting rejection, the examiner should compare the reference claim with the application claim. A rejection is appropriate if the designs are of differing scope but patentably indistinct and are directed to the same inventive concept. [4]

[4] Manual of Patent Examination Procedure, §1504.06

The claims of the present invention are patentably distinct over Casey and Luciani, and not merely 'diminimus'. For example, Casey's claim 1 is directed to "a VPN ... comprising ... a plurality of routers ... a first table ... of label switched paths ... a second table ... of nested label switched paths ... of routers which share a common VPN identifier..."

Claim 1 of Luciani states "... A method of supporting multiple Virtual Private Networks... comprising ... establishing a connection ... using in-band signaling to designate the connection for a number of VPNs; and multiplexing packets from the multiple Virtual Private Networks over the connection..."

Claim 1 of the present invention includes the steps of "...A method for supporting virtual private networks in a label switched communication system having an ingress device in communication with an egress device via a number of intermediate devices, the method comprising ... including label information and a virtual private network identifier in Next Hop Resolution Protocol messages, the virtual private network identifier identifying a virtual private network; and using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network..." No mention or suggestion is found in Casey, Luciani or the combination thereof for including labels in the Next Hop Resolution Protocol messages, as recited in claim 1 and the other independent claims. Accordingly, for at least the reason that the claims of the present invention are distinct from those of Casey and Luciani , Appellants respectfully request that the judicial obviousness double patenting rejection is improper and should be withdrawn.

**C. The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. §103(a) for the rejection of claims 1, 14 and 53-55 over Liu in view of Armitage, and for the rejection of claims 56-60 over Armitage in view of Liu.**

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations." Manual of Patent Examining Procedure §2143.

Liu, U.S. Pat. No. 6,079,020

Liu describes a method and apparatus for managing a virtual private network (VPN) operating over a public data network. The public network includes a plurality of VPN gateways so that communications across the VPN are channeled through the gateways. In one embodiment, a system receives a command and determines which VPN gateways are affected by the command. The system then automatically translates the command into configuration parameters for VPN gateways affected by the command. The configuration parameters specify how the VPNs handle communications between specific groups of addresses on the public data network. (Column 3, lines 1-20).

In particular, at column 9, lines 39-48, Liu describes:

> "... A VPN gateway object 600 is created for each VPN gateway in the network. A VPN gateway object comprises a number of parameters including an Internet Protoocl (IP) address of the VPN gateway. A group object 610 is created for groups of network nodes on public network 100. In this embodiment, a group object includes an identifier for the VPN gateway associated with the group and the net/mask pairs the group defines. A VPN object 620 comprises a number of attributes including a list of groups and a list of remote clients included in the underlying VPN..."

At column 10, lines 26-56, Liu describes, in part:

"... Fig. 9 is a flow chart illustrating some of the operations performed by VPN management station 160 in order to create a VPN... The system starts in state 900 and proceeds to state 902. In state 902, the system gets the current VPN object, which is the subject of the VPN creation command. The system proceeds to state 904. In state 904, the system gets a list of groups involved in the command, in other words the groups to be included in the VPN. The system then proceeds to state 906. In state 906, the system gets a list of all VPN gateways involved in the command by examining the appropriate fields in the VPN group objects. The system then proceeds to state 908. In state 908, the system aggregates network/mask pairs for all groups involved in the operations. Network mask pairs specify networks and address masks to specify a group. .. In state 910, the system performs a collation operation to create configuration information for the VPN gateways. This configuration information allows each VPN gateway to determine which communications are to be encrypted. The system then proceeds to state 912. "

Thus Liu maintains VPN data at the gateways to determine which IP addresses are involved in VPNs. The data is used to selectively encrypt or decrypt data received on the Public internet. *No mention is made in Liu of performing any type of routing determination*, rather Liu states, at column 7, lines 27-33 "... At decision box 22, the system determines whether or not the source and destination addresses for the data packet are both members of the same VPN group. This determination may be made with reference to lookup tables that are maintained by the VPN gateways or by referencing to other memory mechanisms, but requires the source and destination addresses for this purpose. This state may

be thought of as member filtering for data packets being transmitted between particular site and the VPN gateway which services it. If the source and destination addresses for the data packet are not both members of the same VPN group, then at state 230 the packet is forwarded to the Internet as ordinary Internet traffic from the site, as though the VPN gateway were not involved..."

Armitage, U.S. 6,374,303

Armitage describes an arrangement of field of label augmented, multi-protocol routing of data packets in a network using fixed length labels that are negotiated between adjacent label routing routers in a network. Routing labels are used in lieu of conventional address headers to route data packets through the network. (Abstract).

**1.) Appellants can find no suggestion or motivation to combine the reference teachings as suggested by the Examiner.**

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab,* 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir.

2000). See also *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The Examiner states, at page 3 of the office action of February 20, 2003 "... Armitage teaches using the Next Hop Resolution protocol messages to dynamically establish a label switched path for the virtual private network (Figures 1, 2, 3, 4, 5, & 6, Abstract, column 7 line 55 to column 8 line 32)... Therefore it would be obvious to one with ordinary skill in the art at the time the invention was made to include the Next Hop Resolution Protocol messages of Armitage with the system of Liu, because it resolves a routing solution quicker..."

It is well established that "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is *some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art.* "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab,* 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)..." (MPEP §2143).

The Examiner's cited motivation that the combination would be obvious because ".. it resolves a routing solution quicker..." cannot be inferred from the references.

With regard to routing, Liu states, at page 7, lines 14-19:

"... The packet proceeds from endstation 112 over LAN 110 to the routing device 114, which encapsulates the data packet in accordance with the Internet Protocol, forming an outbound IP packet. On its way out of the site, the IP packet passes through the associated VPN gateway 1115 for that site. ."

The law specifically states that "...The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)..." The Examiner states further, at page 3, that "It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the label information and VPN identifier fields ... because it would hasten the speed in which a path through the network could be resolved..." Applicants, respectfully disagree.

Liu explicitly teaches a VPN system which is separate from the routing operations. The VPN operation of Liu require the source and destination addresses (see column 7 of Liu). Thus, Appellants submit that the integration of labels into Liu would *not* serve to resolve routing quicker, as the source and destination address checking must still be done for security purposes in Liu.

Appellants can therefore find no motivation for the modification suggested by the Examiner. Accordingly, Applicants submit that the rejection under 35 U.S.C. §103 does not satisfy the prima facie burden of obviousness and should be withdrawn.

**2). The combination of references fail to describe or suggest every limitation in the claims.**

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royce*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. §103 then any claim depending there from is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

**Claims 1, 14 and 53-60:**

Each claim of the present application is directed toward a Network Resolution Hop Protocol message that includes a label for establishing a label switched path and a virtual private network identifier. Because each claim recites these elements, they each have separate patentable merit.

For example, claim 1 recites "... A method for supporting virtual private networks in a label switched communication system having an ingress device in communication with an egress device via a number of intermediate devices, the method comprising ... including label information and a virtual private network identifier in Next Hop Resolution Protocol messages, the virtual private network identifier identifying a virtual private network ... and ...using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network..." Independent claim 53 recites "... wherein a label switched path is established for a virtual private network by including label information and a virtual private network identifier in Next Hop Resolution protocol messages... to dynamically establish a label switched path for the virtual

private network..." Independent claim 58 is directed to a protocol message including "a virtual private network identifier ... and ... label information relating to a label switched path associated with the virtual private network..."

In the combination of cited references, Applicants can find no suggestion or description in Liu of "...including ... **label information and a virtual private network identifier** ..." in "Next Hop Resolution Protocol..." messages. Rather, the only time that it appears that VPN IDs are transferred in Liu is in establishing databases at the VPN gateways.

The Examiner admits, at page 3 of the Office Action of February 2003 that 'Liu does not teach using the Next Hop Resolution Protocol Messages to dynamically establish a label switched path for the virtual private network... Armitage teaches using the Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network ... Therefore it would be obvious to one of ordinary skill in the art at the time the invention was made3 to include the Next Hop Resolution Protocol messages of Armitage with the system of Liu, because it resolves a routing solution quicker..."

Applicant's disagree with the Examiners' assertion that Armitage teaches using 'Next Hop Resolution Protocol' packets to dynamically establish a label switched path for the virtual private network. Rather, Armitage appears to discuss a Label Distribution Protocol (LDP) wherein portions of the label 'may be assigned by both upstream and downstream routers in the network' (Armitage,

Abstract). It would appear that the Examiner is not giving patentable weight to the term 'Next Hop Resolution Protocol' used in the claims.

Accordingly, for at least the reason that independent claims 1, 19, 36 and 53 all include the limitation of "...wherein the label switching logic including a label request and a virtual private network identifier in Next Hop Resolution Protocol request messages...", all the independent claims are patentably distinct over the combination of references cited by the Examiner, and therefore the rejection should be withdrawn.

Dependent claims 2-18, 20-35, 37-52 and 54-60 serve to add further patentable limitations to their parent independent claims but are patentably distinct for at least the reasons put forth above with regard to those claims.

**D. The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. §103(a) for the rejection of claims 15 through 18 over Liu in view of Armitage and further in view of Halpern, U.S. Patent 6,438,100.**

Halpern, U.S. Patent 6,438,100

Halpern describes a method an apparatus that includes processing that detects when connectivity to a Route Server Instance (RSI) host that is supporting an active RSI has failed and provides a replacement RSI host from a redundancy set. In particular, Halpern describes, at column 10, lines 34-37 "... Between RSIs and routing entities outside of the RSIs reals, RSIs use either internal or external routing protocols to exchange routing information, and NHRP to support the creation of shortcut transport

connections..." Thus, Halpern in essence teaches that NHRP is *not* used to exchange routing information (rather internal or external routing protocols are used). Accordingly, Halpern fails to overcome the inadequacies of the combination of Armitage and Liu, described above with regard to the claims.

Claims 15-18:

In particular, Halpern fails to describe or suggest the limitations of claim 15, which recites ".. The method of claim 1, wherein using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network comprises using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for a return path from the egress device to the ingress device for the virtual private network..." Dependent claims 16-18 serve to add further patentable limitations to claim 15, and are therefore allowable for at least the reasons put forth for claim 15.

**E. The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. §103(a) for the rejection of claims 19, 20, 36 and 37 as being unpatentable over Halpern in view of Liu.**

**Claims 19, 20, 36 and 37:**

Claim 19 recites "... A device for supporting virtual private networks in a label switched communication system, the device comprising label switching logic operably coupled ***to establish a label switched path for the virtual private network using Next Hop Resolution Protocol messages***, wherein the label switching logic including a label request and a virtual private network identifier in Next Hop Resolution Protocol request

messages, and wherein the label switching logic includes label mapping information and the virtual private network identifier in Next Hop Resolution Protocol reply messages..."

Claim 36 recites "...A program product comprising a computer readable medium having embodied therein a computer program for supporting virtual private networks in a label switched communication system, the computer program comprising label switching logic programmed ***to establish a label switched path for the virtual private network using Next Hop Resolution Protocol messages***, wherein the label switching logic is programmed to include a label request and a virtual private network identifier in Next Hop Resolution Protocol request messages, and wherein the label switching logic is programmed to include label mapping information and the virtual private network identifier in Next Hop Resolution Protocol reply message..."

As described above, Halpern in fact teaches away from the use of NHRP messages for exchanging routing information, and the Examiner admits that no such support is found in Liu. For at least these reasons, claims 19 and 36, and their respective dependent claims 20 and 37 are patentably distinct over the combination of Liu and Halpern, and it is requested that the rejection be withdrawn.

**F. The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. §103(a) for the rejection of claims 21-35 and 38-52 over Halpern in view of Liu and further in view of Armitage.**

Claims 21-35 and 38-52:

Claim 21 through 35 and 38-52 depend upon claims 20 and 37, which are patentably distinct for the reasons provided above. Accordingly, because the

combination of Halpern, Liu and Armitage fail to disclose several limitations of the claimed invention, it is respectfully requested that the rejection of these claims be withdrawn.

## IX. Conclusion

Appellant submits therefore that the rejection of claims 1-60 under 35 U.S.C. § 103 is improper for failing to provide a combination that teaches all elements of the claims and for failing to provide sufficient motivation to combine the cited references. It is therefore respectfully requested that the Board reverse the Examiner's rejections under 35 U.S.C. §103.

Respectfully Submitted,

5/11/05
Date

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## Appendix A: Claims

1. (Original) A method for supporting virtual private networks in a label switched communication system having an ingress device in communication with an egress device via a number of intermediate devices, the method comprising:

including label information and a virtual private network identifier in Next Hop Resolution Protocol messages, the virtual private network identifier identifying a virtual private network; and

using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network.

2. (Original) The method of claim 1, wherein the label information and the virtual private network identifier is included within a Next Hop Resolution Protocol message in a type-length-value field having at least a virtual private network identifier field for carrying the virtual private network identifier and a label information field for carrying the label information.

3. (Original) The method of claim 1, wherein using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network comprising using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for a forward path from the ingress device to the egress device for the virtual private network.

4. (Original) The method of claim 3, wherein using said Next Hop Resolution Protocol messages to dynamically establish the label switched path for the forward path from the ingress device to the egress device for the virtual private network comprises:

sending a Next Hop Resolution Protocol request message by the ingress device;

forwarding the Next Hop Resolution Protocol request hop-by-hop from the ingress device to the egress device by each immediate device that is on the forward path;

sending a Next Hop Resolution Protocol reply message by the egress device; and

forwarding the Next Hop Resolution Protocol reply message hop-by-hop from the egress device to the ingress device by each intermediate device that is on the forward path.

5. (Original) The method of claim 4, wherein the Next Hop Resolution Protocol request message is a Next Hop Resolution Protocol Resolution Request message, and wherein the label information comprises a label request.

6. (Original) The method of claim 4, wherein the Next Hop Resolution Protocol reply message is a Next Hop Resolution Protocol Resolution Reply message, and wherein the label information comprises label mapping information.

7. (Original) The method of claim 4, wherein the Next Hop Resolution Protocol reply message is a Next Hop Resolution Protocol Label Mapping message, and wherein the label information comprises label mapping information.

8. (Original) The method of claim 4, wherein forwarding the Next Hop Resolution Protocol request message by an intermediate device comprises:

receiving the Next Hop Resolution Protocol request message from a previous hop device on the forward path;

maintaining previous hop state information for said previous hop device; and

forwarding the Next Hop Resolution Protocol request message to a next hop device on the forward path.

9. (Original) The method of claim 8, wherein forwarding the Next Hop Resolution Protocol reply message by an intermediate device comprises:

receiving a first Next Hop Resolution Protocol reply message from a next hop device on the forward path;

allocating a forward path label for a label switched path segment from a previous hop device on the forward path to said intermediate device; and

sending a second Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier to said previous hop device on the forward path based upon the previous hop state information.

10. (Original) The method of claim 4, wherein forwarding the Next Hop Resolution Protocol request message by an intermediate device comprises:

receiving the Next Hop Resolution Protocol request message from a previous hop device on the forward path, the Next Hop Resolution Protocol request message including a forward path address list;

adding an intermediate device address to the forward path address list in the Next Hop Resolution Protocol request message; and

forwarding the Next Hop Resolution Protocol request message including the forward path address list to a next hop device on the forward path.

11. (Original) The method of claim 10, wherein the forward path address list comprises a Next Hop Resolution Protocol Forward Transit NHS Record Extension field.

12. (Original) The method of claim 4, wherein forwarding the Next Hop Resolution Protocol reply message by an intermediate device comprises:

receiving a first Next Hop Resolution Protocol reply message from a next hop device on the forward path, the Next Hop Resolution Protocol reply message including a return path address list including at least an address of a previous hop device on the forward path;

allocating a forward path label for a label switched path segment from a previous hop device on the forward path to said intermediate device; and

sending a second Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier to said previous hop device on the forward path based upon the address in the return path address list.

13. (Original) The method of claim 4, wherein sending a Next Hop Resolution Protocol reply message by the egress device comprises:

receiving the Next Hop Resolution Protocol request message from a previous hop device on the forward path;

allocating a forward path label for a label switched path segment from said previous hop device on the forward path to the egress device; and

sending the Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier to said previous hop device on the forward path.

14. (Original) The method of claim 13, wherein the Next Hop Resolution Protocol request message including a forward path address list including at least an address of the previous hop device on the forward path, and wherein sending the Next Hop Resolution Protocol reply message to the previous hop device on the forward path comprises sending the Next Hop Resolution Protocol reply message to the previous hop device on the forward path based upon the address in the forward path address list.

15. (Original) The method of claim 1, wherein using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for the virtual private network comprises using said Next Hop Resolution Protocol messages to dynamically establish a label switched path for a return path from the egress device to the ingress device for the virtual private network.

16. (Original) The method of claim 15, wherein using said Next Hop Resolution Protocol messages to dynamically establish the label switched path for the return path from the egress device to the ingress device for the virtual private network comprises:

sending a Next Hop Resolution Protocol request message by the ingress device; and

forwarding the Next Hop Resolution Protocol request message hop-by-hop from the egress device to the ingress device by each intermediate device that is on the forward path.

17. (Original) The method of claim 15, wherein sending the Next Hop Resolution Protocol request message by the ingress device comprises:

allocating a return path label for a label switched path segment from a next hop device on the forward path to the ingress device; and

sending the Next Hop Resolution Protocol request message including said return path label and the virtual private network identifier to said next hop device on the forward path.

18. (Original) The method of claim 15, wherein forwarding the Next Hop Resolution Protocol request message by an intermediate device comprises:

receiving a first Next Hop Resolution Protocol request message from a previous hop device on the forward path;

allocating a return path label for a label switched path segment from a next hop device on the forward path to the intermediate device; and

sending a second Next Hop Resolution Protocol request message including said return path label and the virtual private network identifier to said next hop device on the forward path.

19. (Original) A device for supporting virtual private networks in a label switched communication system, the device comprising label switching logic operably coupled to establish a label switched path for the virtual private network using Next Hop Resolution Protocol messages, wherein the label switching logic including a label request and a virtual

private network identifier in Next Hop Resolution Protocol request messages, and wherein the label switching logic includes label mapping information and the virtual private network identifier in Next Hop Resolution Protocol reply messages.

20. (Original) The device of claim 19, wherein the label switching logic comprises:

transmitting logic operably coupled to transmit to a next hop device in the communication network a Next Hop Resolution Protocol request message including a label request and the virtual private network identifier; and

receiving logic operably coupled to receive from said next hop device in the communication network a Next Hop Resolution Protocol reply message including a forward path label for a label switched path segment to said next hop device in the communication network and the virtual private network identifier.

21. (Original) The device of claim 20, wherein the label switching logic is operably coupled to establish the label switched path to said next hop device in the communication network using said forward path label.

22. (Original) The device of claim 20, wherein the label switching logic further comprises return path label allocation logic operably coupled to allocate a return path label for a label switched path segment from said next hop device in the communication network, and wherein the transmitting logic is operably coupled to transmit to said next hop device in the communication network the Next Hop Resolution Protocol request message including said return path label in addition to the label request and the virtual private network identifier.

23. (Original) The device of claim 19, wherein the label switching logic comprises:

request message receiving logic operably coupled to receive from a previous hop device in the communication network a first Next Hop Resolution Protocol request message including a label request and the virtual private network identifier;

reply message receiving logic operably coupled to receive from said next hop device in the communication network a Next Hop Resolution Protocol reply message including label mapping information and the virtual private network identifier;

forward path label allocation logic operably coupled to allocate a forward path label for a label switched path segment from the previous hop device in the communication network; and

reply message transmitting logic operably coupled to transmit to said previous hop device in the communication network a second Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier.

24. (Original) The device of claim 23, wherein the request message receiving logic is operably coupled to maintain previous hop state information for said previous hop device in the communication network, and wherein the reply message transmitting logic is operably coupled to transmit the second Next Hop Resolution Protocol reply message to said previous hop device in the communication network based upon the previous hop state information.

25. (Original) The device of claim 23, wherein the first Next Hop Resolution Protocol request message includes a forward path address list, and wherein the label switching logic is operably

coupled to insert a device address into the forward path address list and include the forward path address list in the second Next Hop Resolution Protocol request message.

26. (Original) The device of claim 25, wherein the forward path address list comprises a Next Hop Resolution Protocol Forward Transit NHS Record Extension field.

27. (Original) The device of claim 25, wherein the first Next Hop Resolution Protocol reply message includes a return path address list including at least an address for said previous hop device in the communication network, and wherein the reply message transmitting logic is operably coupled to transmit the second Next Hop Resolution Protocol reply message to said previous hop device in the communication network based upon the address in the list of addresses.

28. (Original) The device of claim 27, wherein the reply message transmitting logic is operably coupled to remove an address from the return path address list to form a modified return path address list and to include the modified return path address list in the second Next Hop Resolution Protocol reply message.

29. (Original) The device of claim 23, wherein the first Next Hop Resolution Protocol request message includes a return path label for a label switched path segment to said previous hop device, and wherein a label switching logic is operably coupled to establish a label switched path to said previous hop device using said return path label.

30. (Original) The device of claim 23, wherein the label switching logic further comprises return path label allocation logic operably coupled to allocate a return path label for a label switched path segment from said next hop device in the communication network, and wherein the request message transmitting logic is operably coupled to transmit to said next hop device in the communication network the second Next Hop Resolution Protocol request message including said return path label in addition to the label request and the virtual private network indicator.

31. (Original) The device of claim 19, wherein the label switching logic comprises:

receiving logic operably coupled to receive from a previous hop device in the communication network a Next Hop Resolution Protocol request message including a label request and the virtual private network identifier;

forward path label allocation logic operably coupled to allocate a forward path label for a label switched path segment from said previous hop device in the communication network; and

transmitting logic operably coupled to transmit to said previous hop device in the communication network a Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier.

32. (Original) The device of claim 31, wherein the Next Hop Resolution Protocol request message includes a forward path address list, and wherein the transmitting logic is operably coupled to include the forward path address list as a return path address list in the Next Hop Resolution Protocol reply message.

33. (Original) The device of claim 31, wherein the Next Hop Resolution Protocol request message includes a return path label for a label switched path segment to said previous hop device in the communication network, and wherein the label switching logic is operably coupled to establish the label switched path to said previous hop device in the communication network using said return path label.

34. (Original) The device of claim 19, wherein the Next Hop Resolution Protocol request messages comprise Next Hop Resolution Protocol Resolution Request messages.

35. (Original) The device of claim 19, wherein the Next Hop Resolution Protocol reply messages comprise one of:

Next Hop Resolution Protocol Reply messages; and

Next Hop Resolution Protocol Label Mapping messages.

36. (Original) A program product comprising a computer readable medium having embodied therein a computer program for supporting virtual private networks in a label switched communication system, the computer program comprising label switching logic programmed to establish a label switched path for the virtual private network using Next Hop Resolution Protocol messages, wherein the label switching logic is programmed to include a label request and a virtual private network identifier in Next Hop Resolution Protocol request messages, and wherein the label switching logic is programmed to include label mapping information and the virtual private network identifier in Next Hop Resolution Protocol reply message.

37. (Original) The program product claim of claim 36, wherein the label switching logic comprises:

transmitting logic programmed to transmit to a next hop device in the communication network a Next Hop Resolution Protocol request message including a label request and the virtual private network identifier; and

receiving logic programmed to receive from said next hop device in the communication network a Next Hop Resolution Protocol reply message including a forward path label for a label switched path segment to said next hop device in the communication network and the virtual private network identifier.

38. (Original) The program product of claim 37, wherein the label switching logic is programmed to establish the label switched path to said next hop device in the communication network using said forward path label.

39. (Original) The program product claim of claim 37, wherein the label switching logic further comprises return path label allocation logic programmed to allocate a return path label for a label switched path segment from said next hop device in the communication network, and wherein the transmitting logic is programmed to transmit to said next hop device in the communication network the Next Hop Resolution Protocol request message including said return path label in addition to the label request and the virtual private network identifier.

40. (Original) The program product of claim 36, wherein the label switching logic comprises:

request message receiving logic programmed to receive from a previous hop device in the communication network a first Next Hop Resolution Protocol request message including a label request and the virtual private network identifier;

request message transmitting logic programmed to transmit to a next hop device in the communication network a second Next Hop Resolution Protocol request message including the label request and the virtual private network identifier;

reply message receiving logic programmed to receive from said next hop device in the communication network a first Next Hop Resolution Protocol reply message including label mapping information and the virtual private network identifier;

forward path label allocation programmed to allocate a forward path label for a label switched path segment from the previous hop device in the communication network; and

reply message transmitting logic programmed to transmit to said previous hop device in the communication network a second Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier.

41. (Original) The program product of claim 40, wherein the request message receiving logic is programmed to maintain previous hop state information for said previous hop device in the communication network, and wherein the reply message transmitting logic is programmed to transmit the second Next Hop Resolution Protocol reply message to said previous hop device in the communication network based upon the previous hop state information.

42. (Original) The program product of claim 40, wherein the first Next Hop Resolution Protocol request message includes a forward path address list, and wherein the label switching logic is

programmed to insert a device address into the forward path address list and include the forward path address list in the second Next Hop Resolution Protocol request message.

43. (Original) The program product of claim 42, wherein the forward path address list comprises a Next Hop Resolution Protocol Forward Transit NHS Record Extension field.

44. (Original) The program product of claim 42, wherein the first Next Hop Resolution Protocol reply message includes a return path address list including at least an address for said previous hop device in the communication network, and wherein the reply message transmitting logic is programmed to transmit the second Next Hop Resolution Protocol reply message to said previous hop device in the communication network based upon the address in the list of addresses.

45. (Original) The program product of claim 44, wherein the reply message transmitting logic is programmed to remove an address from the return path address list to form a modified return path address list and to include the modified return path address list in the second Next Hop Resolution Protocol reply message.

46. (Original) The program product claim of claim 40, wherein the first Next Hop Resolution Protocol request message includes a return path label for a label switched path segment to said previous hop device, and wherein the label switching logic is programmed to establish a label switched path to said previous hop device using said return path label.

47. (Original) The program product claim of claim 40, wherein the label switching logic further comprises return path label allocation logic programmed to allocate a return path label for a label switched path segment from said next hop device in the communication network, and wherein the request message transmitting logic is programmed to transmit to said next hop device in the communication network the second Next Hop Resolution Protocol request message including said return path label in addition to the label request and the virtual private network indicator.

48. (Original) The program product claim of claim 36, wherein the label switching logic comprises:

receiving logic programmed to receive from a previous hop device in the communication network a Next Hop Resolution Protocol request message including a label request and the virtual private network identifier;

forward path label allocation logic programmed to allocate a forward path label for a label switched path segment from said previous hop device in the communication network; and transmitting logic programmed to transmit to said previous hop device in the communication network a Next Hop Resolution Protocol reply message including said forward path label and the virtual private network identifier.

49. (Original) The program product claim of claim 48, wherein the Next Hop Resolution Protocol request message includes a forward path address list, and wherein the transmitting logic is programmed to include the forward path address list as a return path address list in the Next Hop Resolution Protocol reply message.

50. (Original) The program product claim of claim 48, wherein the Next Hop Resolution Protocol request message includes a return path label for a label switched path segment to said previous hop device in the communication network, and wherein the label switching logic is programmed to establish the label switched path to said previous hop device in the communication network using said return path label.

51. (Original) The program product of claim 36, wherein the Next Hop Resolution Protocol request messages comprise Next Hop Resolution Protocol Resolution Request messages.

52. (Original) The program product claim of claim 36, wherein the Next Hop Resolution Protocol reply messages comprise on of:

Next Hop Resolution Protocol Resolution reply messages; and

Next Hop Resolution Protocol Label Mapping messages.

53. (Original) A communication system comprising an ingress device in communication with an egress device via a number of intermediate devices, wherein a label switched path is established for a virtual private network by including label information and a virtual private network identifier in Next Hop Resolution Protocol messages and using said Next Hop Resolution Protocol messages to dynamically establish the label switched path for the virtual private network.

54. (Original) The communication system of claim 53, wherein:

the ingress device sends a Next Hop Resolution Protocol request message including at least a label request and the virtual private network identifier to a next hop device on a forward path from the ingress device to the egress device;

each intermediate device on the forward path forwards the Next Hop Resolution Protocol request message to a next hop device on the forward path;

the egress device send s Next Hop Resolution Protocol reply message including at least forward path label mapping information and the virtual private network identifier to a previous hop device on the forward path; and

each intermediate device on the forward path forwards the Next Hop Resolution Protocol reply message to a previous hop device on the forward path.

55. (Original) The communication system of claim 54, wherein the ingress device further includes return path label mapping information in the Next Hop Resolution Protocol request message, and wherein each intermediate device on the forward path further includes return path label mapping information in the Next Hop Resolution Protocol request message.

56. (Original) A protocol message comprising:

a virtual private network identifier identifying a virtual private network for the protocol message; and

label information relating to a label switched path associated with the virtual private network.

57. (Original) The protocol message of claim 56 embodied as a next hop resolution protocol message.

58. (Original) The protocol message of claim 56, wherein the label information comprises label request information.

59. (Original) The protocol message of claim 56, wherein the label information comprises label mapping information.

60. (Original) The protocol message of claim 56 embodied in a carrier wave for transmission over a communication network.